EFFECTIVENESS OF ROSELLE FLOWER TEA AND BLUE PEA FLOWER TEA TO DECREASED BLOOD SUGAR LEVELS IN ELDERLY AT MALANGREJO, SLEMAN, YOGYAKARTA

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Abstract

An increase in blood glucose level can raise the risk of prediabetes incidence, especially in elderly persons due to aging, therefore they are susceptible to suffering diabetes mellitus. This can be prevented non-pharmacologically, that is, by consuming roselle flower tea and blue pea flower tea, which can lower blood glucose levels and are safe to be consumed due to their naturalproperties.To determine the effectiveness of roselle flower tea and blue pea flower tea consumption on blood glucose level in elderly persons in Malangrejo Hamlet Integrated Health Service Post, Wedomartani, Ngemplak, Sleman, Yogyakarta. The metode is quasi-experiment research with a pre and post-test nonequivalent control group design. The research was conducted between 13-30 April 2019, with 36 respondents involved as samples. The samples were selected using a simple random sampling technique, and the data collected were analyzed using the Wilcoxon test, Paired T-Test, and Mann-Whitney U test. The Respondents in the roselle tea group had a median pre-test random blood sugar (RBS) value of 122 mg/dl and post-test RBS value of 112 mg/dl, whereas in the blue pea flower group, the median pre-test RBS value was 137.8 mg/dl and the post-test RBS value was 125.6 mg/dl. The control group had a median pre-test RBS value of 118.5 mg/dl and post-test RBS value of 124.5 mg/dl. Results of the Wilcoxon test on the roselle group showed a p-value = 0.015 and in the control group, the p-value = 0.346, whereas the paired t-test results on the blue pea group showed a p-value = 0.002. Results of Mann-Whitney U-test on the roselle group showed a p-value = 0.015 and in the blue pea-control group, the p-value = 0.371, whereas, in the roselle-blue pea group, the p-value =0.506. There was a significant difference in the pre-test and post-test RBS in the roselle group and blue pea group but there was no significant difference in the post-test RBS value between the roselle group and the blue pea group.

Keywords: Roselle, Blue pea, RBS

1. INTRODUCTION

Elderly defined as a person aged over 60 years old [1]. Social Security Administration, elderly divided into 3 categories, young-old (65-75 years old), the middle old (75-84 years old), and the very old (ages 85 and up) [2,3]. The population of elderly in Indonesia (2017) about 23,66 million people (9,03%), and in Yogyakarta about 13,81% [1]. Elderly vulnerable to health problems, such as diabetes mellitus (DM), that defined as a bunch of disorders from an increased blood sugar level [4]. The prevalence of DM in Indonesia is about 1,3% in 2013 and increased in 2018 is about 2,0%. In Yogyakarta prevalence, DM is about 3,1% in 2018 [5]. DM can be complicated if blood sugar at a high level. Blood sugar on peoplewithDM can be controlled with DM management in conventional (medical) and alternative and complementary therapy[6].

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Alternative and complementary therapy use herb such as roselle tea and blue pea tea[7,8]. Roselle contains Hibiscus acid as inhibitory activity pancreatic amylase so that can reduced blood glucose [7]. The antioxidant content in blue pea flower can increased regeneration of β-pancreatic cell so that can reduced blood glucose [8,9]. Results from introduction study 6 of 9 respondents have blood glucose that classified as prediabetes in range 110-199 mg/dl. The purpose of this study is to know the effectiveness of roselle tea and blue pea tea for decreased blood glucose levels in the elderly.

2. METHODS

This study is a quasi-experiment with design pre-test and post-test control group. Technique sampling using simple random sampling with sample size 36 respondents, that divided into 3 groups (roselle group, blue pea group, and control group). Analysis using the Wilcoxon test, Paired T-Test, and Mann-Whitney test. This study located at Malangrejo, Wedomartani, Ngemplak, Sleman, Yogyakarta, from 13 to 30 April 2019. Respondents were requested to drink the tea once a day for 14 days with a dose of 5 grams roselle flower tea or blue pea flower tea perday.

3. RESULTS AND DISCUSSION

Based on Table 1, all of the respondents (36 respondents) classified into young old. Reviewed of gender, the majority of the respondents were female 10 respondents (83,8%) in the control group and in blue pea group, and 9 respondents (75%) in the roselle group. Reviewed of exercise habit, the majority all of the respondents have an exercise habit, 9 peoples (75%) in control group and blue pea group, and 11 peoples (91,7%) in roselle group.

Table 1
Frequency Distribution of Respondent Characteristics Based on Age, Gender, and Exercise Habit in Elderly at Malangrejo, Mei 2019 (n=36)

Respondent Characteristics	Control Group		Roselle Group		Blue Pea Group	
	f	%	f	%	f	%
Age						
Young Old	12	100	12	100	12	100
Gender						
Male	2	16,7	3	25	2	16,7
Female	10	83,3	9	75	10	83,3
Exercise Habit						
Exercise	9	75	11	91,7	9	75
Don't Exercise	3	25	1	8,3	3	25
Frequency of Exercise						
Don't Exercise	3	25	1	8,3	3	25
1x a week	9	75	9	75	7	58,3
2x a week	-	-	2	16,7	1	8,3
3x a week	-	-	-	-	1	8,3
Duration of Exercise						
Don't Exercise	3	25	1	8,3	3	25
≤30 minutes	6	50	8	66,7	5	41,7
>30 minutes	9	25	3	25	4	33,3

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Reviewed of the frequency of exercise (Table 1), the majority of respondents doing the exercise once a week in roselle group and control group each group were 9 peoples (75%) and 7 peoples in blue pea group. Reviewed of exercise duration, majority of respondents have ≤30 minutes doing exercise in the control group were 6 peoples (50%), 8 peoples (66,7%) in roselle group, and 5 peoples (41,7%) in blue pea group.

Table 2
Frequency Distribution of Respondent Characteristics Based on Dietary Habit in Elderly at Malangrejo, Mei 2019 (n=36)

Respondent Characteristics	Control Group		Roselle Group		Blue Pea Group	
	f	%	f	%	f	%
Frequency of Carbohydrate Foods Consumption						
1x a day	-	-	1	8,3	-	-
2x a day	9	75	6	50	5	41,7
3x a day	3	25	5	41,7	7	58,3
Portion of Carbohydrate Foods Consumption						
1/3 plate	6	50	5	41,7	7	58,3
1/2 plate	4	33,3	6	50	5	41,7
1 plate	2	16,7	1	8,3	-	-
Frequency of Vegetables Consumption						
1x a day	2	16,7	2	16,7	2	16,7
2x a day	8	66,7	6	50	6	50
3x a day	2	16,7	4	33,3	4	33,3
Portion of Vegetables						
1/3 plate	10	83,3	8	66,7	8	66,7
1/2 plate	2	16,7	4	33,3	3	25
1 plate	-	-	-	-	1	8,3
Frequency of Fruits Consumption						
Don't eat fruits	1	8,3	-	-	4	33,3
1x a day	3	25	7	58,3	6	50
2x a day	7	58,3	1	8,3	1	8,3
3x a day	1	8,3	4	33,3	1	8,3
Portion of fruit						
Don't eat of the fruit	1	8,3	-	-	4	33,3
1/3 of fruit	4	33,3	1	8,3	-	-
1/2 of fruit	1	8,3	2	16,7	1	8,3
1 of fruit	6	50	9	75	7	58,3

Based on Table 2, the majority in control group have frequency of carbohydrate foods consumption 2x a day were 9 respondents (75%) and in roselle group were 6 respondents (50%), while the majority in blue pea group have 3x a day frequency of carbohydrate foods consumption was 7 respondents (58,3%). Reviewed of the portion of carbohydrate foods, the majority have 1/3 plate in control group were 6 respondents (50%) and blue pea group portion was 7 respondents (58,3%), while the majority in the roselle group have portion 1/2 plate were 6 respondents (50%). Frequency of vegetable consumptionmajorityinallgrouphave2xaday,incontrolgroupwere8respondents(66,7%), in

roselle group the same as in blue pea group were 6 respondents (50%).

Reviewed of the portion of vegetables, the majority have portion 1/3 plate in all group, in control group were 10 respondents (83,3%), in roselle group the same as blue pea group was 8 respondents (66,7%). Reviewed of the frequency of fruits consumption, the majority in the control group have 2x a day 7 respondents (58,3%), and in roselle group, the same as blue pea group majority have 1x a day that is 7 respondents (58,3%) and 6 respondents (50%). The portion of fruits consumption, the majority in all groups have 1 fruit, that is in roselle group 9 respondents (75%), while blue pea group that is 7 respondents (58,3%) and in control group 6 respondents (50%).

Table 3
Frequency Distribution of Random Blood Sugar Levels Pre Test and Post Test in Elderly at Malangrejo, Mei 2019 (n=36)

Random Blood Sugar Levels	Min-Max (mg/dl)	Mean/ Median (mg/dl)	Standard Deviation (mg/dl)
Control Group			
Pre Test	113-176	118,5	18,6
Post Test	108-198	124,5	26,5
Roselle Group			
Pre Test	113-194	122	24,9
Post Test	97-167	112	22
Blue Pea Group			
Pre Test	111-184	137,8	21,9
Post Test	103-165	125,6	19,8

Table 4
Random Blood Sugar Levels Pre Test Based on Gender and Exercise Habit in Control Group, Mei 2019 (n=12)

Respondents Characteristic	n	Random Blood Sugar Levels Pre Test	
		Min-Max (mg/dl)	Median (mg/dl)
Gender			
Male	2	116-118	117
Female	10	113-176	120,5
Exercise Habit			
Exercise	9	113-176	119
Don't Exercise	3	116-134	118
Frequency of Exercise			
Don't Exercise	3	116-134	118
1x a week	9	113-176	119
Duration of Exercise			
Don't Exercise	3	116-134	118
≤30 minutes	6	113-176	125,5
>30 minutes	3	114-119	116

Based on Table 3 showed random blood sugar for pre-test and post-test in control group have median value 118,5 mg/dl and 124,5 mg/dl and in roselle group have median value 122 mg/dl and 112 mg/dl, while in blue pea group have mean value for pre-test and post-test 137,8 mg/dl and 125,6 mg/dl. Based on Table 4 the majority of respondents in the control group were female with a median value of random blood sugar levels 120,5 mg/dl.

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Reviewed of exercise habits, the majority have exercise habits with frequency 1x a week and duration ≤30 minutes have a maximum value of 176 mg/dl.

Table 5
Random Blood Sugar Levels Pre Test Based on Dietary Habit in Control Group, Mei 2019
(n=12)

Respondent Characteristic	n	Random Blood Sugar Levels PreTest	
		Min-Max (mg/dl)	Median (mg/dl)
Frequency of Carbohydrate Foods Consumption			
2x a day	9	115-176	122
3x a day	3	113-116	115
The portion of Carbohydrate Foods			
1/3 of plate	6	113-134	120,5
1/2 of plate	4	115-176	132
1 of the plate	2	116-118	117
Frequency of Vegetable Consumption			
1x a day	2	115-116	115,5
2x a day	8	115-176	125,5
3x a day	2	113-116	114,5
Portion of Vegetable			
1/3 of plate	10	113-176	118,5
1/2 of plate	2	115-148	131,5
Frequency of Fruit Consumption			
Don't eat fruit	1	-	-
1x a day	3	118-129	119
2x a day	7	113-176	116
3x a day	1	-	-
Portion of Fruit			
Don't eat fruit	1	-	-
1/3 fruit	1	-	-
1/2 fruit	4	115-176	132
1 fruit	6	113-129	117

Based on Table 5 majority in the control group have a frequency of carbohydrate foods consumption 2x a day and portion 1/3 plate with a median value of random blood sugar levels 122 mg/dl and 120 mg/dl. Reviewed of the frequency of vegetable consumption, the majority have 2x a day and portion 1/3 plate with a median of random blood sugar levels 125,5 mg/dl and 118,5 mg/dl. Reviewed of the frequency of fruits consumption majority of respondents have 2x a day and portion 1 fruit with a median of random blood sugar levels 117 mg/dl.

Based on Table 6 Reviewed of gender, the majority in the roselle group dominated by the female with a median of random blood sugar levels 121 mg/dl. Reviewed of the frequency of carbohydrate foods consumption at most have 2x a day and portion 1/2 plate with median random blood sugar levels 121,5 mg/dl. Frequency of vegetable consumption at most of the respondents have 3x a day and portion 1/3 plate with a median of random blood sugar 150,5 mg/dl and 123,5 mg/dl. Reviewed of the frequency of fruit consumption majority have 1x a day and portion 1 fruit has a median random blood sugar 121 mg/dl and 122 mg/dl.Majorityofrespondentshaveexercisehabitwithfrequency1xaweekandduration

≤30 minutes have median random blood sugar levels 122 mg/dl and 121 mg/dl.

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Table 6
Random Blood Sugar Levels Pre Test Based on Gender, Dietary and Exercise Habit in Roselle Group, Mei 2019 (n=12)

Respondents Characteristic	n	Random Blood Sugar Levels PreTest	
		Min-Max (mg/dl)	Median (mg/dl)
Gender			
Male	3	120-127	121
Female	9	113-194	122
Frequency of Carbohydrate Foods Consumption			
1x a day	1	-	-
2x a day	6	113-125	121,5
3x a day	5	119-174	122
The portion of Carbohydrate Foods			
1/3 plate	5	119-194	125
1/2 plate	6	113-125	121,5
1 plate	1	-	-
Frequency of Vegetable Consumption			
1x a day	2	120-122	121
2x a day	4	113-125	121,5
3x a day	6	119-194	150,5
Portion of Vegetable			
1/3 plate	8	119-194	123,5
1/2 plate	4	113-125	121
Frequency of Fruit Consumption			
1x a day	7	119-194	121
2x a day	1	-	-
3x a day	4	122-174	126
Portion of Fruit			
1/3 fruit	1	-	-
1/2 fruit	2	120-122	121
1 fruit	9	113-194	122
Exercise Habit			
Exercise	11	113-194	122
Don't Exercise	1	-	-
Frequency of Exercise			
Don't Exercise	1	-	-
1x a week	9	113-194	121
2x a week	2	122-125	123,5
Duration of Exercise			
Don't Exercise	1	-	-
≤30 minutes	8	113-194	122
>30 minutes	3	120-194	121

Based on Table 7 majority in the blue pea group were female with a mean of random blood sugar levels 139,9 mg/dl. Reviewed of exercise habits, the majority have exercise habits with frequency 1x a week and duration ≤30 minutes have mean 126 mg/dl and 125,8 mg/dl. Based on Table 8 majority of respondents in blue pea group have a frequency of carbohydrate foods consumption 3x a day and portion 1/3 plate have mean random blood sugar levels 137,4 mg/dl and 139,5 mg/dl. Reviewed of the frequency of vegetable consumption, the majority 2x a day and portion 1/3 plate have mean random blood sugar levels 138,5 mg/dl and 146,6 mg/dl. Reviewed of frequency fruit consumption majority 1x a day and portion 1 fruit have mean 130,3 mg/dl and 139 mg/dl.

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Table 7
Random Blood Sugar Levels Pre Test Based on Gender and Exercise Habit in Blue Pea Group, Mei 2019 (n=12)

Respondents Characteristic	n	Random Blood Sugar Levels PreTest	
		Min-Max (mg/dl)	Median (mg/dl)
Gender			
Male	2	125-130	127,5
Female	10	111-184	139,9
Exercise Habit			
Exercise	9	111-184	133,3
Don't Exercise	3	130-167	151,3
Frequency of Exercise			
Don't Exercise	3	130-167	151,3
1x a week	7	111-146	126
2x a week	1	-	-
3x a week	1	-	-
Duration of Exercise			
Don't Exercise	3	130-167	151,3
≤30 minutes	5	111-146	125,8
>30 minutes	4	124-184	142,7

Table 8
Random Blood Sugar Levels Pre Test Based on Dietary Habit in Blue Pea Group, Mei 2019 (n=12)

Respondents Characteristic	n	Random Blood Sugar Levels PreTest	
		Min-Max (mg/dl)	Median (mg/dl)
Frequency of Carbohydrate Foods Consumption			
2x a day	5	111-184	138,4
3x a day	7	121-167	137,4
The portion of Carbohydrate Foods			
1/3 plate	7	111-184	139,5
1/2 plate	5	117-167	135,4
Frequency of Vegetable Consumption			
1x a day	2	130-167	148,5
2x a day	6	111-184	138,3
3x a day	4	121-157	131,7
Portion of Vegetable			
1/3 plate	8	117-184	146,6
1/2 plate	3	121-125	123,3
1 plate	1	-	-
Frequency of Fruit Consumption			
Don't eat fruit	4	121-167	141
1x a day	6	111-157	130,3
2x a day	1	-	-
3x a day	1	-	-
Portion of Fruit			
Don't eat fruit	4	121-167	141
1/2 fruit	1	-	-
1 fruit	7	111-184	139

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Based on Table 9 in the control group have median random blood sugar levels pre- test 118,5 mg/dl and post-test 124,5 mg/dl with p value=0,346 which means there is no significant difference before and after given mineral water.

Table9
Difference in Random Blood Sugar Level Pre Test and Post Test in Control Group

Random Blood Sugar Levels	Min-Max (mg/dl)	Median (mg/dl)	P *value*
Pre Test	113-176	118,5	0,346*
Post Test	108-198	124,5	

*Wilcoxon Test

Based on Table 10 in the roselle group have median random blood sugar levels pre-test 122 mg/dl and post-test 112 mg/dl with p value=0,015 which means there is a significant difference before and after given roselle flower tea for 14 days.

Table10
The difference in Random Blood Sugar Level Pre Test and Post Test in Roselle Group

Random Blood Sugar Levels	Min-Max (mg/dl)	Median (mg/dl)	p-*value*
Pre Test	113-194	122	0,015*
Post Test	97-167	112	

*Wilcoxon Test

Based on Table 11 in blue pea group have mean random blood sugar levels pre-test 137,8 mg/dl and post-test 125,6 mg/dl with p value=0,002 which means there is a significant difference before and after given blue pea flower tea for 14 days.

Table11
The difference in Random Blood Sugar Level Pre Test and Post Test in Blue Pea Group

Random Blood Sugar Levels	Mean ± SD (mg/dl)	Mean Difference ± SD (mg/dl)	p-*value*
PreTest	137,8 ± 21,9	12,25 ±10	0,002*
Post Test	125,6 ± 19,8		

*Paired T-Test **SD: Standard Deviation

Based on Table 12 difference post-test results of random blood sugar levels have p value=0,100 that means there is no significant difference between the control group and the roselle group.

Table12
The difference in Random Blood Sugar Level Post Test in Control Group and Roselle Group

Random Blood Sugar Levels	Min-Max (mg/dl)	Median (mg/dl)	p-*value*
Control Group	108-198	124,5	0,100*
Roselle Group	97-167	112	

*Mann-Whitney U Test

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Based on Table 13 difference post-test results of random blood sugar levels have p value=0,371 that means there is no significant difference between the control group and the blue pea group.

Table13
The difference in Random Blood Sugar Level Post Test in Control Group and Blue Pea Group

Random Blood Sugar Levels	Min-Max (mg/dl)	Median (mg/dl)	p-*value*
Control Group	108-198	124,5	0,371*
Blue Pea Group	103-165	121	

*Mann-Whitney U Test

Based on Table 14 difference post-test results of random blood sugar levels have p value=0,506 that means there is no significant difference between the roselle group and the blue pea group.

Table14
The difference in Random Blood Sugar Level Post Test in Roselle Group and Blue Pea Group

Random Blood Sugar Levels	Min-Max (mg/dl)	Median (mg/dl)	p-*value*
Roselle Group	97-167	112	0,506*
Blue Pea Group	103-165	121	

*Mann-Whitney U Test

3.1. Characteristics of Respondents

Age can affect blood sugar levels. Based on Table 1, as many 36 respondents have random blood sugar level that classified as prediabetes who are on young old categories that range between 60 – 75 years old [1,3]. It is accordingly with the results of the previous study that have a correlation between age and prevalence of type 2 diabetes mellitus. In that study, the majority of respondents were over 60 years old (89,4%)[10]. Other studies indicate there is a correlation between age and prevalence of type 2 diabetes mellitus that age over 45 years old have a higher risk [11].

Table 4 represents the random blood sugar level based on gender in all groups, dominated by a female. In control group were 10 female (83,8%) who have random blood sugar level with median 120,5 mg/dl. Based on Table 6, in roselle group have 9 female (75%) with median 131,8 mg/dl. Based on Table 7, in blue pea group were 10 female (83,8%) have random blood sugar level with mean 137,8 mg/dl. The previous study indicates a correlation between gender and prevalence type 2 diabetes mellitus which is females have a higher risk than male[s] [10]. Other studies that show female have a higher risk than the male because pregnancy is a risk factor of prevalence diabetes mellitus, mainly on the female with diabetes mellitus gestational [12].

In Table 5, random blood sugar level for pre-test in control group with maximum value is 176 mg/dl and frequency of carbohydrate foods consumption 2x a day with portion 1/2 plate, while in roselle group based on Table 6 have maximum value 174 mg/dl with frequency 3x a day and portion 1/3 plate and in blue pea group have maximum value of 184 mg/dl with frequency 2x a day and portion 1/3 plate (Table 8). Carbohydrate foods such as rice, wheat, bread, noodles, corn, and potatoes, will digest by the digestive system that it will be changed into glucose, that distributes to all cells through blood as energy sources.

Frequency of carbohydrate foods consumption that recommended was 3x a day with a portion 1/3 plate or 150 grams rice or 300 grams potatoes or 75 grams driednoodles[13,14].Based on Table 5 describe the frequency of fruits consumption majority in the control group has 2x a day with portion 1 fruit has maximum value random blood sugar level 176 mg/dl. The majority in the roselle group's fruits consumption is 1x a day with portion 1 fruit has a maximum value of 194 mg/dl, while the majority in the blue pea group 1 a day with portion 1 fruit has maximum value 184 mg/dl. Its different with fruits consumption that recommended was 3x a day after a heavy meal and as snack 2x a day in between heavy meals. Fruits consumption that recommended with a portion 1/3 plate equivalent with 150 gramspapaya [13,15].

Based on Table 4, the majority of respondents in the control group have exercise habit with frequency 1x a week and duration for ≤30 minutes have median value random blood sugar 119 mg/dl and 125,5 mg/dl, while in roselle group have a median value 122 mg/dl (Table 6) and in blue pea group have to mean value 126 mg/dl. Exercise can also affect blood sugar levels that increased insulin sensitivity that can increased glucose uptake as energy resources and can decrease blood sugar level^S [16]. This study also supports the previous study that shows a correlation between exercise and blood sugar level and having exercise habits can decrease the risk of diabetes mellitus [17,18].

3.1.1 The difference in Random Blood Sugar Level Pre Test and Post Test in Control Group

Random blood sugar levels in the control group have a median value for pre-test 118,5 mg/dl and post-test 124,5 mg/dl with p value=0,346 (Table 9) which means there is no significant difference between before and after given mineral water. Its support by the previous study represent given sterile water show there is no significant difference [7]. Increased blood sugar levels can be influenced by other factors, such as consumption of carbohydrate foods and lack of fiber intake from vegetables and fruits[15].

3.1.2.The difference in Random Blood Sugar Level Pre Test and Post Test in Roselle Group

Random blood sugar levels in the roselle group have a median for pre-test 122 mg/dl and post-test 112 mg/dl with p value=0,015 (Table 10) that show there is a significant difference. This study support by the previous study, decreased blood sugar levels after given roselle tea for 14 days because roselle flowers contain Hibiscus acid compounds, polyphenols, and flavonoids as an activity inhibitor of pancreatic α-amylase and intestine α-glucosidase [7, 19, 20]. Another previous study that shows lowering blood sugar levels after given roselle extracts peroral or combination roselle tea and stevia [21,22].

3.1.3 The difference in Random Blood Sugar Level Pre Test and Post Test in Blue Pea Group

Based on Table 11, random blood sugar levels have a mean for pre-test 137,8 mg/dl and post-test 125,6 mg/dl with p value=0,002 which means there is a significant difference. Decreased random blood sugar because blue pea flower contains phenolic acid compounds, flavonoids, anthocyanin, and another phenolic acid that decreased or activity inhibitor of gluconeogenic enzyme and glucose-6-phosphatase and increased insulin serum [23].

A previous study that shows decreased blood sugar levels after given blue pea extracts with dose 400mg/kg weight [24]. It is also supported by other previous study have the same results and

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after given extracts methanol of blue pea with dose 300 mg/kg weight for 12 days a decreased glucose serum. It can happen because blue pea extracts can stimulate cells to produced and released insulin that can effect to cells metabolism [9, 25].

3.1.4.The difference in Random Blood Sugar Level Post Test in Control Group and Roselle Group

Difference random blood sugar levels for post-test between the control group and the roselle group have p value=0,100 (Table 12) which means there is no significant difference. However, from the results of pre-test and post-test of random blood sugar levels, the roselle group has better results in decreased blood sugar rather than the control group. In the control group just given mineral water (just have components of H2O and minerals) while the roselle group was given roselle tea that has components of Hibiscus acid, polyphenols, and flavonoids that can be lowering blood sugar [20,26,27].

No difference between post-test random blood sugar levels in the control group and the roselle group because there are factors that can affect blood sugar. Reviewed characteristics of respondents in the control group majority have a frequency of carbohydrate consumption 2x a day with portion 1/3 plate (Table 5), while in the roselle group majority have a frequency twice a day with portion 1/2 plate (Table 6). In the roselle, the group has a bigger portion of carbohydrates than the control group. This can happen because carbohydrate foods can increase blood sugar and a portion of carbohydrate foods that recommended is 1/3plate [13,15].

Another factor that affects blood sugar is fruit consumption. Majority in the control group have fruits consumption 2x a day with a maximum of random blood sugar levels pre-test 176 mg/dl (Table 5) better than roselle group that majority respondents have fruits consumption 1x a day with maximum random blood sugar levels pre-test 194 mg/dl (Table 6). This can happen because fruits have fiber that stimulates pancreatic beta cells to produced insulin and inhibits the absorption of glucose toblood [15].

3.1.5.The difference in Random Blood Sugar Level Post Test in Control Group and Blue Pea Group

Based on Table 13 random blood sugar levels post-test with p value=0,371 that means there is no significant difference between the control group and the blue pea group. However, in the blue pea group pre-test and post-test have better results than the control group (Table 11) because blue pea has components that decrease blood sugar, such as phenolic acid, flavonoids, anthocyanin, and otherphenolics [19, 20, 23].

Factors that can affect blood sugar such as carbohydrate foods. Majority in the control group have frequency of carbohydrate foods consumption 2x a day and fruits consumption 2x a day with maximum random blood sugar levels 176 mg/dl (Table 5), while in roselle group majority carbohydrate foods consumption 3x a day and frequency of fruits consumption 1x a day with maximum value 184 mg/dl. Consumption of carbohydrate foods can increase blood sugar levels and fruits fiber can slow down glucose absorption so that blood sugar does not increasedramatically [13, 15].

3.1.6. The difference in Random Blood Sugar Level Post Test in Roselle Group and Blue Pea Group

Based on Table 14 random blood sugar levels post-test between the roselle group and the blue

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pea group have p value=0,506 that means there is no significant difference.

This can happen because roselle tea and blue pea tea are the same as having compound content that can decrease blood sugar. In roselle flower have compound such as Hibiscus acid, polyphenols, and flavonoids, while in blue pea flower have compound phenolic acid, flavonoids, and anthocyanin [19]. This study support by the previous study that studies about the difference in flavonoids content in 5 kinds of plants, that is roselle flower, chrysanthemum flower, mulberry, bael, and blue pea flower. In that study explain that in roselle flower have lower flavonoids content (50,29±2,38 mg/grams of dried flower) than the blue pea flower that has compound 78,28 mg/grams of driedflower [19].

4. CONCLUSIONS

The consumption of roselle tea and blue pea tea can decrease random blood sugar levels for pre-test and post-test in elderly and no significant difference between the result post-test of roselle tea and blue pea tea.

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